SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PENILAIAN ALTERNATIF BERIKUTAN
PELAKSANAAN PERINTAH KAWALAN BERSYARAT

SESI JUN 2020

DBM30043 : ELECTRICAL ENGINEERING MATHEMATICS

NAMA PENYELARAS KURSUS : LEE TEN TEN

KAEDAH PENILAIAN	**: PEPERIKSAAN ONLINE**
JENIS PENILAIAN	**: SOALAN ESEI BERSTRUKTUR (2 SOALAN)**
TARIKH PENILAIAN	**: 22 DISEMBER 2020**
TEMPOH PENILAIAN	**: 1 JAM**

LARANGAN TERHADAP PLAGIARISM (AKTA 174)
PELAJAR TIDAK BOLEH MEMPLAGIAT APA-APA IDEA, PENULISAN, DATA ATAU CIPTAAN ORANG LAIN. PLAGIAT ADALAH SALAH SATU PENYELEWENGAN AKADEMIK. SEKIRANYA PELAJAR DIBUKTIKAN MELAKUKAN PLAGIARISM, PENILAIAN BAGI KURSUS BERKENAAN AKAN DIMANSUHKAN DAN DIBERI GRED F DENGAN NILAI MATA 0.
(RUJUK BUKU ARAHAN-ARAHAN PEPERIKSAAN DAN KAEDAH PENILAIAN (Diploma) EDISI 6, JUN 2019, KLAUSA 17.3)

INSTRUCTION:
This question paper consists of **TWO (2)** structured questions. Answer **All** questions.

Write your answers in the Alternative Exam answer sheet.

ARAHAN :
*Kertas soalan ini mengandungi **DUA (2)** soalan struktur. Jawab **Semua** soalan. Tulis jawapan anda di dalam kertas jawapan Penilaian Alternatif.*

QUESTION 1
SOALAN 1

CLO1
C2

a) Express the following functions in a form of differential equation.
Nyatakan fungsi yang berikut ke bentuk persamaan pembezaan.

i. $y = 7Ax^3$ (4 marks/*markah*)

ii. $y = x^2 + \frac{A}{x}$ (6 marks/*markah*)

CLO1
C3

b) Solve the differential equations below by using an appropriate method.
Selesaikan persamaan pembezaan yang berikut dengan menggunakan kaedah yang sesuai.

i. $\frac{d^2y}{dx^2} - 4y = 0$

(4 marks/*markah*)

ii. $e^x \frac{dy}{dy} = 4$ given $y = 3$ when $x = 0$

$e^x \frac{dy}{dy} = 4$ diberi $y = 3$ apabila $x = 0$

(5 marks/*markah*)

iii. $x\frac{dy}{dx} = 4y + x^5$

(6 marks/*markah*)

QUESTION 2
SOALAN 2

CLO1
C2

a) Convert the following functions into Laplace Transform
Tukarkan fungsi yang berikut kepada Jelmaan Laplace

i) $f(t) = 5e^{-2t} + 7 - \frac{3}{2}e^{2t}cos2t$ (by using Laplace Transform Table)
(*menggunakan Jadual Jelmaan Laplace*)
(5 marks/*markah*)

ii) $f(t) = t^2 e^{-\frac{3}{2}t}$ (by using multiplication with t^n)
(*menggunakan pendaraban dengan* t^n)
(5 marks/*markah*)

CLO1
C3

b) Use appropriate method to find the Inverse Laplace Transform for the following function.
Gunakan kaedah yang sesuai untuk mendapatkan fungsi Jelmaan Laplace Songsang bagi fungsi yang berikut.

$$F(s) = \frac{1 - 4s}{s^2 + 16}$$

(4 marks/*markah*)

CLO1
C3

c) Solve the following differential equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 4y = 4$ with initial condition where $y(0) = 0$ and $y'(0) = 2$
Selesaikan persamaan pembezaan $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 4y = 4$ *dengan syarat* $y(0) = 0$ *dan* $y'(0) = 2$

(11 marks/*markah*)

SOALAN TAMAT

FORMULA DBM30043 - ELECTRICAL ENGINEERING MATHEMATICS

<table>
<tr><th colspan="2">SOLUTION FOR 1st ORDER DIFFERENTIAL EQUATION</th></tr>
<tr><td rowspan="2">Homogeneous Equation
$y = vx$ and $\frac{dy}{dx} = v + x\frac{dv}{dx}$</td><td>Linear Factors (Integrating Factors)
$y \bullet IF = \int Q \bullet IF\, dx$
Where $IF = e^{\int P\, dx}$</td></tr>
<tr><td>Logarithmic
$a = e^{\ln a}$
$a^x = e^{x \ln a}$
$\int a^x\, dx = \frac{a^x}{\ln a} + c$</td></tr>
<tr><th colspan="2">GENERAL SOLUTION FOR 2nd ORDER DIFFERENTIAL EQUATION</th></tr>
<tr><td>Equation of the form</td><td>$a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = 0$</td></tr>
<tr><td>Quadratics Formula</td><td>$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$</td></tr>
<tr><td>1. Real & different roots2</td><td>$y = Ae^{m_1 x} + Be^{m_2 x}$</td></tr>
<tr><td>2. Real & equal roots</td><td>$y = e^{mx}(A + Bx)$</td></tr>
<tr><td>3. Complex roots</td><td>$y = e^{\alpha x}(A\cos\beta x + B\sin\beta x)$</td></tr>
</table>

LAPLACE TRANSFORM					
No.	$f(t)$	$F(s)$	No.	$f(t)$	$F(s)$
1.	a	$\frac{a}{s}$	13.	$e^{-at}\sin\omega t$	$\frac{\omega}{(s+a)^2+\omega^2}$
2.	at	$\frac{a}{s^2}$	14.	$e^{-at}\cos\omega t$	$\frac{s+a}{(s+a)^2+\omega^2}$
3.	t^n	$\frac{n!}{s^{n+1}}$	15.	$\sinh\omega t$	$\frac{\omega}{s^2-\omega^2}$
4.	e^{at}	$\frac{1}{s-a}$	16.	$\cosh\omega t$	$\frac{s}{s^2-\omega^2}$
5.	e^{-at}	$\frac{1}{s+a}$	17.	$e^{at}\sinh\omega t$	$\frac{\omega}{(s-a)^2-\omega^2}$
6.	te^{-at}	$\frac{1}{(s+a)^2}$	18.	$e^{-at}\sinh\omega t$	$\frac{\omega}{(s+a)^2-\omega^2}$
7.	$t^n.e^{at}$, n=1,2,3	$\frac{n!}{(s-a)^{n+1}}$	19.	$e^{-at}\cosh\omega t$	$\frac{s+a}{(s+a)^2-\omega^2}$
8.	$t^n.f(t)$	$(-1)^n\frac{d^n}{ds^n}[F(s)]$	20.	$f_1(t)+f_2(t)$	$F_1(s)+F_2(s)$
9.	$\sin\omega t$	$\frac{\omega}{s^2+\omega^2}$	21.	$\int_o^t f(u)du$	$\frac{F(s)}{s}$
10.	$\cos\omega t$	$\frac{s}{s^2+\omega^2}$	22.	$f(t-a)u(t-a)$	$e^{-as}F(s)$
11.	$t\sin\omega t$	$\frac{2\omega s}{(s^2+\omega^2)^2}$	23.	First derivative $\frac{dy}{dt}, y'(t)$	$sY(s)-y(0)$
12.	$t\cos\omega t$	$\frac{s^2-\omega^2}{(s^2+\omega^2)^2}$	24.	Second derivative $\frac{d^2y}{dt^2}, y''(t)$	$s^2Y(s)-sy(0)-y'(0)$

DIFFERENTIATION			
1.	$\frac{d}{dx}(k) = 0, k \text{ is constant}$	**2.**	$\frac{d}{dx}(x^n) = nx^{n-1} \quad [Power\ Rule]$
3.	$\frac{d}{dx}(ax^n) = anx^{n-1}$	**4.**	$\frac{d}{dx}\big(f(x) \pm g(x)\big) = f'(x) \pm g'(x)$
5.	$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx} \quad [Product\ Rule]$	**6.**	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2} \quad [Quotient\ Rule]$
7.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} \quad [Chain\ Rule]$	**8.**	$\frac{d}{dx}(e^x) = e^x$
9.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax+b)$	**10.**	$\frac{d}{dx}(\ln x) = \frac{1}{x}$
11.	$\frac{d}{dx}[\ln(ax+b)] = \frac{1}{ax+b} \times \frac{d}{dx}(ax+b)$	**12.**	$\frac{d}{dx}(\sin x) = \cos x$
13.	$\frac{d}{dx}(\cos x) = -\sin x$	**14.**	$\frac{d}{dx}(\tan x) = \sec^2 x$
15.	$\frac{d}{dx}[\sin(ax+b)] = \cos(ax+b) \times \frac{d}{dx}(ax+b)$	**16.**	$\frac{d}{dx}[\cos(ax+b)] = -\sin(ax+b) \times \frac{d}{dx}(ax+b)$
17.	$\frac{d}{dx}[\tan(ax+b)] = sec^2(ax+b) \times \frac{d}{dx}(ax+b)$	**18.**	$\frac{d}{dx}[\sin^n u] = n\sin^{n-1} u \times \cos u \times \frac{du}{dx}$
19.	$\frac{d}{dx}[cos^n u] = n\,cos^{n-1} u \times -\sin u \times \frac{du}{dx}$	**20.**	$\frac{d}{dx}[tan^n u] = n\,tan^{n-1} u \times sec^2 u \times \frac{du}{dx}$

INTEGRATION			
1.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c \quad ;\{n \neq -1\}$	**2.**	$\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{(a)(n+1)} + c\,;\{n \neq -1\}$
3.	$\int k\ dx = kx + c, k \text{ is constant}$	**4.**	$\int_a^b f(x)dx = F(b) - F(a)$
5.	$\int \frac{1}{x}\ dx = \ln x + c$	**6.**	$\int \frac{1}{ax+b}\ dx = \frac{1}{a} \times \ln(ax+b) + c$
7.	$\int e^x\ dx = e^x + c$	**8.**	$\int e^{ax+b}\ dx = \frac{1}{a} \times e^{ax+b} + c$
9.	$\int \sin x\ dx = -\cos x + c$	**10.**	$\int \cos x\ dx = \sin x + c$
11.	$\int sec^2 x\ dx = \tan x + c$		
12.	$\int \sin(ax+b)\ dx = -\frac{1}{\frac{d}{dx}(ax+b)} \times \cos(ax+b) + c$		
13.	$\int \cos(ax+b)\ dx = \frac{1}{\frac{d}{dx}(ax+b)} \times sin\,(ax+b) + c$		
14.	$\int sec^2(ax+b)\ dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		